

I claim:

1. A method which comprises:
 - (a) deprotonating a compound selected from the group consisting of indoles, carbazoles, 8-quinolinols, 2-pyridinols, and mixtures thereof, with an alkyllithium compound to produce an anionic ligand precursor; and
 - (b) reacting the anionic ligand precursor with about 0.5 equivalents of a Group 4 transition metal tetrahalide at a temperature greater than about 10°C in the presence of a hydrocarbon solvent to produce an organometallic complex-containing mixture.
2. The method of claim 1 wherein the ligand precursor is a carbazolyl anion.
3. The method of claim 1 wherein the alkyllithium compound is a C₁-C₈ alkyllithium compound.
4. The method of claim 1 wherein the alkyllithium compound is n-butyllithium.
5. The method of claim 1 wherein the Group 4 transition metal tetrahalide is selected from the group consisting of zirconium tetrachloride and titanium tetrachloride.
6. The method of claim 1 wherein step (b) is performed at a temperature within the range of about 15°C to about 60°C.
7. The method of claim 1 wherein step (b) is performed at room temperature.
8. The method of claim 1 wherein one component of the mixture is an organometallic complex having the structure LL'MCl₂, wherein M is titanium or zirconium, and each of L and L', which may be the same or different, is selected from the group consisting of indolyl, carbazolyl, 8-quinolinoxy, and 2-pyridinoxy.

9. The method of claim 1 further comprising concentrating the product from step (b) without removing insoluble products.

10. An organometallic complex-containing mixture made by the method of claim 1.

11. An organometallic complex-containing mixture made by the method of claim 9.

12. A catalyst system which comprises:

- (a) an activator; and
- (b) the organometallic complex-containing mixture of claim 10.

13. A catalyst system which comprises:

- (a) an activator; and
- (b) the organometallic complex-containing mixture of claim 11.

14. A process which comprises polymerizing an olefin in the presence of the catalyst system of claim 12.

15. A process which comprises polymerizing an olefin in the presence of the catalyst system of claim 13.

16. The process of claim 14 wherein the catalyst system includes methyl alumoxane as an activator, and the methyl alumoxane is used at a [Al:M] molar ratio less than about 500.

17. The process of claim 15 wherein the catalyst system includes methyl alumoxane as an activator, and the methyl alumoxane is used at a [Al:M] molar ratio less than about 500.

18. The process of claim 14 wherein the catalyst system is stored for up to about 90 days prior to use in the process.

19. The process of claim 15 wherein the catalyst system is stored for up to about 90 days prior to use in the process.

20. A method which comprises:

- (a) deprotonating a compound selected from the group consisting of indoles, carbazoles, 8-quinolinols, 2-pyridinols, and mixtures thereof, with an alkyllithium compound to produce an anionic ligand precursor; and
- (b) reacting the anionic ligand precursor with about 1 equivalent of an indenyl Group 4 transition metal trihalide at a temperature greater than about 10°C in the presence of a hydrocarbon solvent to produce an organometallic complex-containing mixture.

21. The method of claim **20** further comprising concentrating the product from step (b) without removing insoluble products.

22. An organometallic complex-containing mixture made by the method of claim **20**.

23. A catalyst system which comprises:

- (a) an activator; and
- (b) the organometallic complex-containing mixture of claim **22**.

24. A process which comprises polymerizing an olefin in the presence of the catalyst system of claim **23**.

25. The process of claim **24** wherein the catalyst system includes methyl alumoxane as an activator, and the methyl alumoxane is used at a [Al:M] molar ratio less than about 500.